Introduction to Mitigation

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Green jobs

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Outline

Mitigation

- Challenges to reduce emissions
- Mitigation technologies
- Policies, measures and instruments
- Sustainable development
- Examples of national mitigation strategies

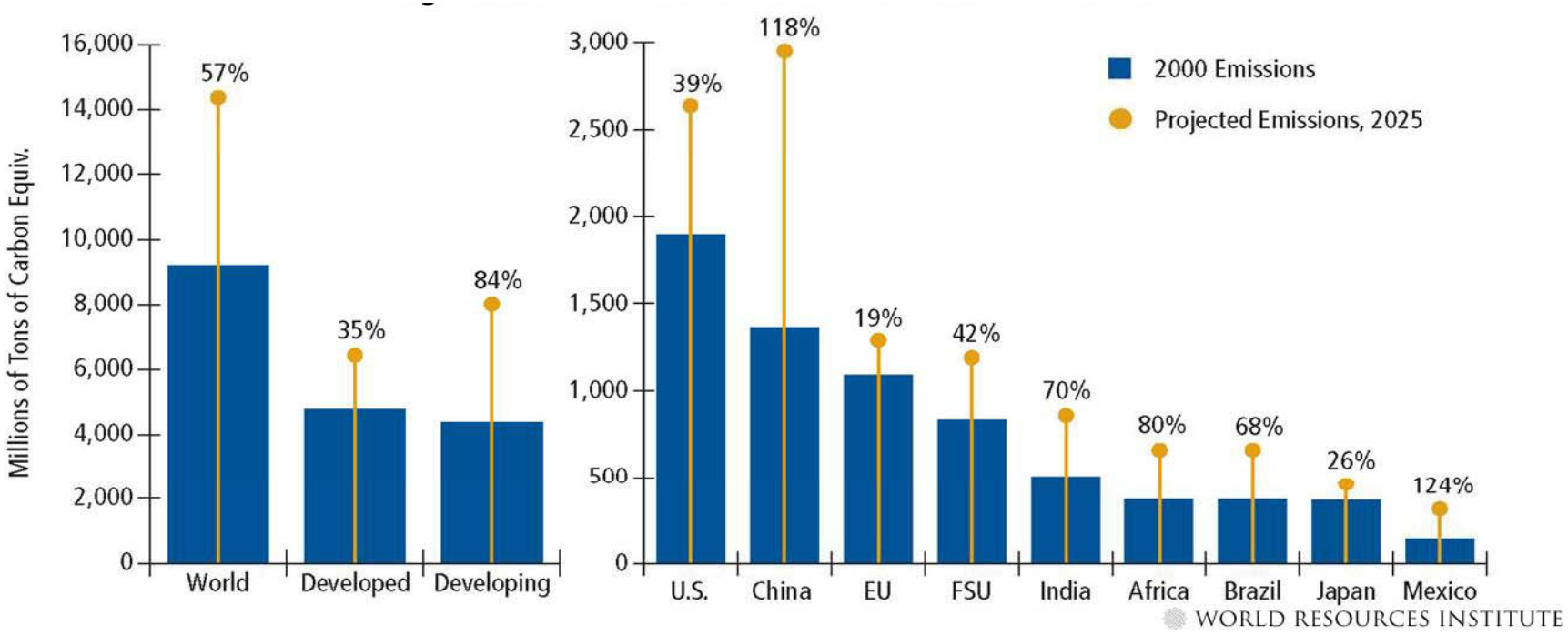
Carbon markets and CDM

- Kyoto Protocol
- CDM

Challenges to reduce GHG emissions

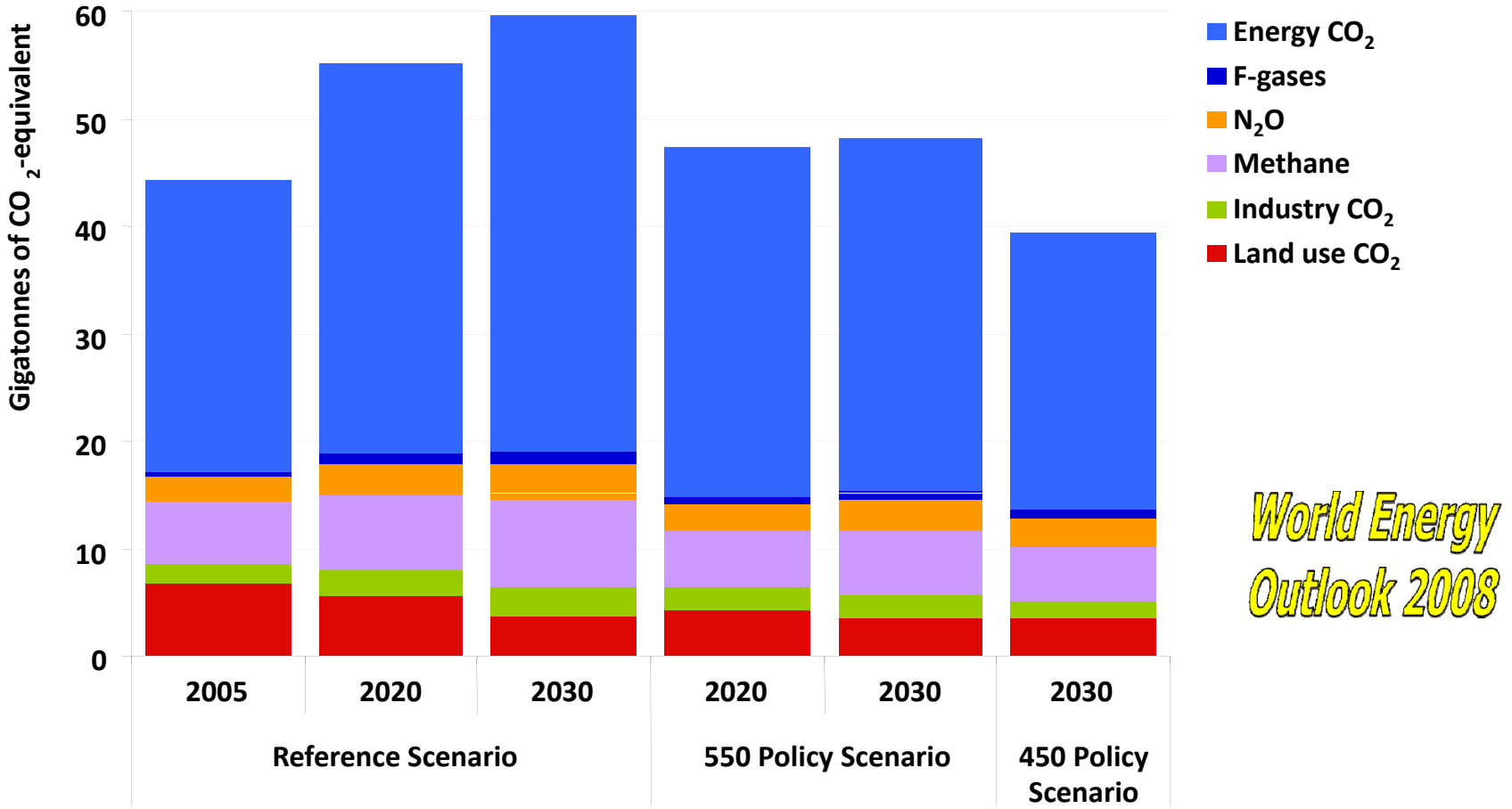
Major Challenges

GHG Emissions Projections for 2025



- Largest emitters where not included in the 1st commitment period
- Developed and developing country emissions currently about equal

World GHG emissions – three scenarios



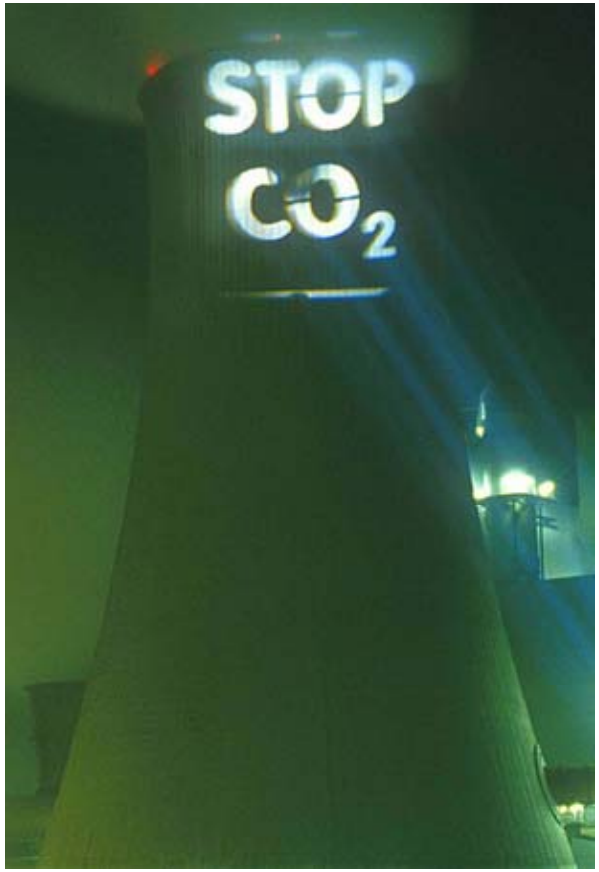
While energy-related CO_2 will continue to dominate, there is strong potential to reduce other emissions through improved efficiency, better farm management & reduced gas flaring

Global trends in GHG emissions

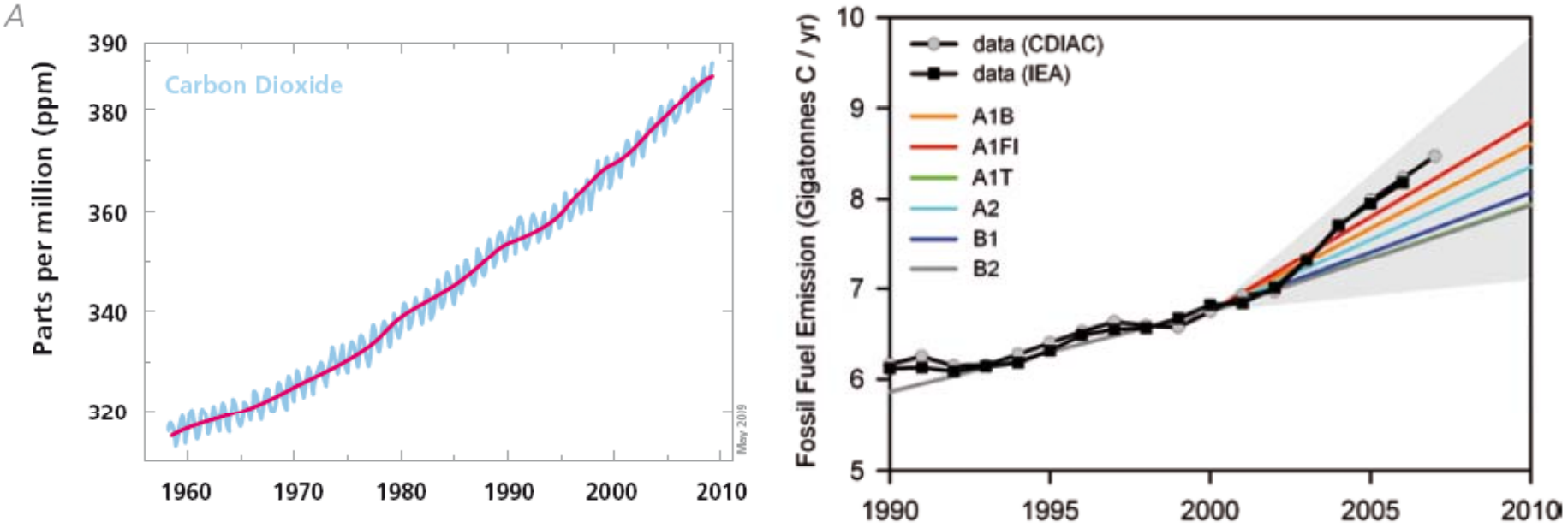
- Global GHG emissions have grown since pre-industrial times.
- Between 1970 and 2004 emissions have increased 70%
- Broken down on sectors the growth in GHG emissions was as follows:
  - Energy supply: 145%
  - Transport: 120%
  - Industry: 65%
  - LULUCF: 40%
  - Agriculture: 27%
  - Buildings: 26%
- The emission of GHGs have increased at different rates:
  - CO_2 emissions represent about 77% of total anthropogenic GHGs and have grown about 80% from 1970 - 2004

The mitigation challenge according to IPCC

- **Without action - global CO_2 emissions will grow between 40 and 110% between 2000 and 2030**
- **To stay below 2 degrees global average warming and avoid major damages:**
  - global CO_2 emissions should start declining by 2015 and
  - be reduced with 50-85% below 2000 level by 2050



Carbon emission trends since 2007 – higher than predicted by IPCC



Observed global fossil-fuel and industrial CO_2 emissions[18], compared with averages of 6 scenario groups from the IPCC Special Report on Emissions Scenarios (coloured lines) and range covered by all individual scenarios (grey shading). Emission data are from two sources: The Carbon Dioxide Information and Analysis Center (CDIAC) and the International Energy Agency (IEA). Figure updated using the latest available data (www.globalcarbonproject.org) since the original publication of this report.

Source: Synthesis Report, Climate change congress, by Richardson et. al., March 2009, Copenhagen

Emission reductions required for stabilising climate with fair distribution of effort

Scenario category	Region	2020	2050
A-450 ppm CO_2-eq [2]	Annex I	**–25% to –40%**	–80% to –95%
	Non-Annex I	Substantial deviation from baseline in Latin America, Middle East, East Asia ***(-15% to -30% from BAU)***	Substantial deviation from baseline in all regions
B-550 ppm CO_2-eq	Annex I	–10% to –30%	–40% to –90%
	Non-Annex I	Deviation from baseline in Latin America and Middle East, East Asia *(0 to -20% from BAU)*	Deviation from baseline in most regions, especially in Latin America and Middle East

Impacts of 2° C warming – worse than expected

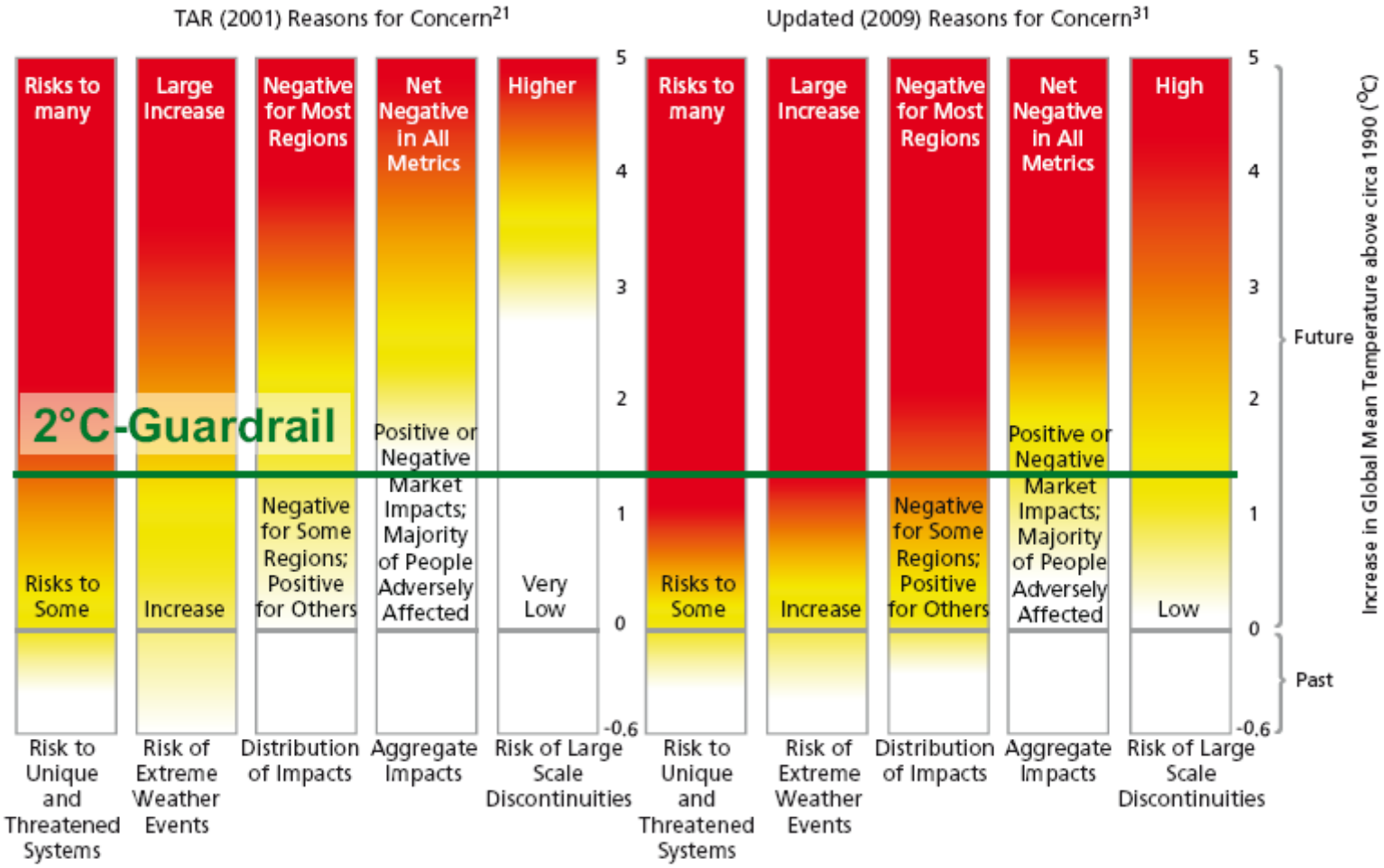


Figure 8
Diagram relating the potential impacts of climate change to the rise in global average temperature. Zero on the temperature scale corresponds approximately to 1990 average temperature, and the bottom of the temperature scale to pre-industrial average temperature. The level of risk or severity of potential impacts increases with the intensity of red colour. The 2°C guardrail is shown for reference.

Mitigation technologies

Mitigation Technologies- Energy Supply

Sector	Key mitigation technologies and practices currently commercially available. (Selected)	Key mitigation technologies and practices projected to be commercialized before 2030. (Selected)
Energy Supply	• energy efficiency • fuel switching from coal to gas • nuclear power • renewable (hydropower, solar, wind, geothermal and bioenergy) • early applications of CO_2 Capture and Storage (CCS)	• CCS for gas • second generation biomass techn. • advanced nuclear power • advanced renewables (tidal and wave energy, concentrating solar, solar PV)

RE industry has been developing very rapidly last 5 years

Mitigation Technologies- Industry

Sector	(Selected) Key mitigation technologies and practices currently commercially available.	Key mitigation technologies and practices projected to be commercialized before 2030. (Selected)
Industry	• More efficient end-use electrical equipment • heat and power recovery; • material recycling and substitution • control of non-CO_2 gasses • and a wide array of process-specific technologies	• Advanced energy efficiency • CCS for cement, ammonia, and iron manufacture • inert electrodes for aluminium manufacture

Mitigation Technologies- Agriculture

Sector	(Selected) Key mitigation technologies and practices currently commercially available.	Key mitigation technologies and practices projected to be commercialized before 2030. (Selected)
Agriculture	• Improved crop and grazing land management to increase soil carbon storage • restoration of cultivated peaty soils and degraded lands • improved rice cultivation techniques and livestock and manure management to reduce CH4 emissions • improved nitrogen fertilizer application techniques to reduce N_2O emissions • dedicated energy crops to replace fossil fuel use • improved energy efficiency.	• Improvements of crops yields.

Mitigation Technologies- Buildings

Sector	(Selected) Key mitigation technologies and practices currently commercially available.	Key mitigation technologies and practices projected to be commercialized before 2030. (Selected)
Buildings	• Efficient lighting • more efficient electrical appliances and heating and cooling devices • improved cook stoves • improved insulation • passive and active solar design for heating and cooling • alternative refrigeration fluids • recovery and recycle of fluorinated gases	• Integrated design of commercial buildings including technologies such as intelligent meters that provide feedback and control • solar PV integrated in buildings

Mitigation technologies - transport

Sector	(Selected) Key mitigation technologies and practices currently commercially available.	Key mitigation technologies and practices projected to be commercialized before 2030. (Selected)
Transport	• More fuel efficient vehicles • hybrid vehicles • biofuels • modal shifts from road transport to rail and public transport systems • cycling, walking • land-use planning	• Second generation biofuels • higher efficiency aircraft • advanced electric and hybrid vehicles with more powerful and reliable batteries

Transport emissions increase rapidly but options still hard

Stern Review on the Economics of Climate Change, 2006

- Climate change is the greatest market failure ever seen
- Postponing emission reductions is very costly, it implies:
  - Greater impacts and adaptation costs
  - Locking in high-carbon infrastructure (such as power-plants expected to last 40-50 years) and delaying ’clean’ technology
  - More drastic cuts in emissions later on
- Putting an appropriate long-term price on carbon is the first element of policy – either through tax, trading (cap and trade) or regulation
- Technology transfer needs more than a carbon price – policies and international cooperation is necessary, e.g. R&D
- Scaling-up carbon finance to developing countries can support a transition to low-carbon development

The benefits of strong, early actions outweigh the cost

Given the costs of impacts, taking urgent action is good economics

Expected cost of cutting emissions consistent with a 550ppm CO2e stabilisation trajectory averages 1% of GDP per year.

- Resource cost: 1% of GDP in 2050, in range –1% to +3.5%.
- Macroeconomic models: 1% of GDP in 2050, in range +/- 3%.

Costs will not be evenly distributed:

- Competitiveness impacts can be reduced by acting together.

There will be opportunities and co-benefits:

- New markets will be created: worth over $500bn a year by 2050
- Climate policy consistent with energy access, energy security, air quality.

Strong mitigation is fully consistent with the aspirations for growth and development in poor and rich countries.

Policies, measures and instruments

Policies are available to governments to realise mitigation of climate change

Effectiveness of policies depends on national circumstances, their design, interaction, stringency and implementation

- Integrating climate policies in broader development policies
- Regulations and standards
- Taxes and charges
- Tradable permits
- Financial incentives
- Voluntary agreements
- Information instruments
- Research and development

Institutional capacity to develop and implement policies needed

Policies, measures and instruments shown to be environmentally effective

Sector	Mitigation ’tools’
Energy supply	• Reduction of fossil fuel subsidies • Taxes or carbon charges on fossil fuels • Feed-in-tariffs for RE technologies • RE obligations • Producer subsidies
Transport	• Mandatory fuel economy • Biofuel blending taxes on vehicles purchase • Registration, use and motor fuels, road and parking pricing • Land use regulations and infrastructure planning to influence mobility needs • Investment in public transport and non-motorised forms of transport

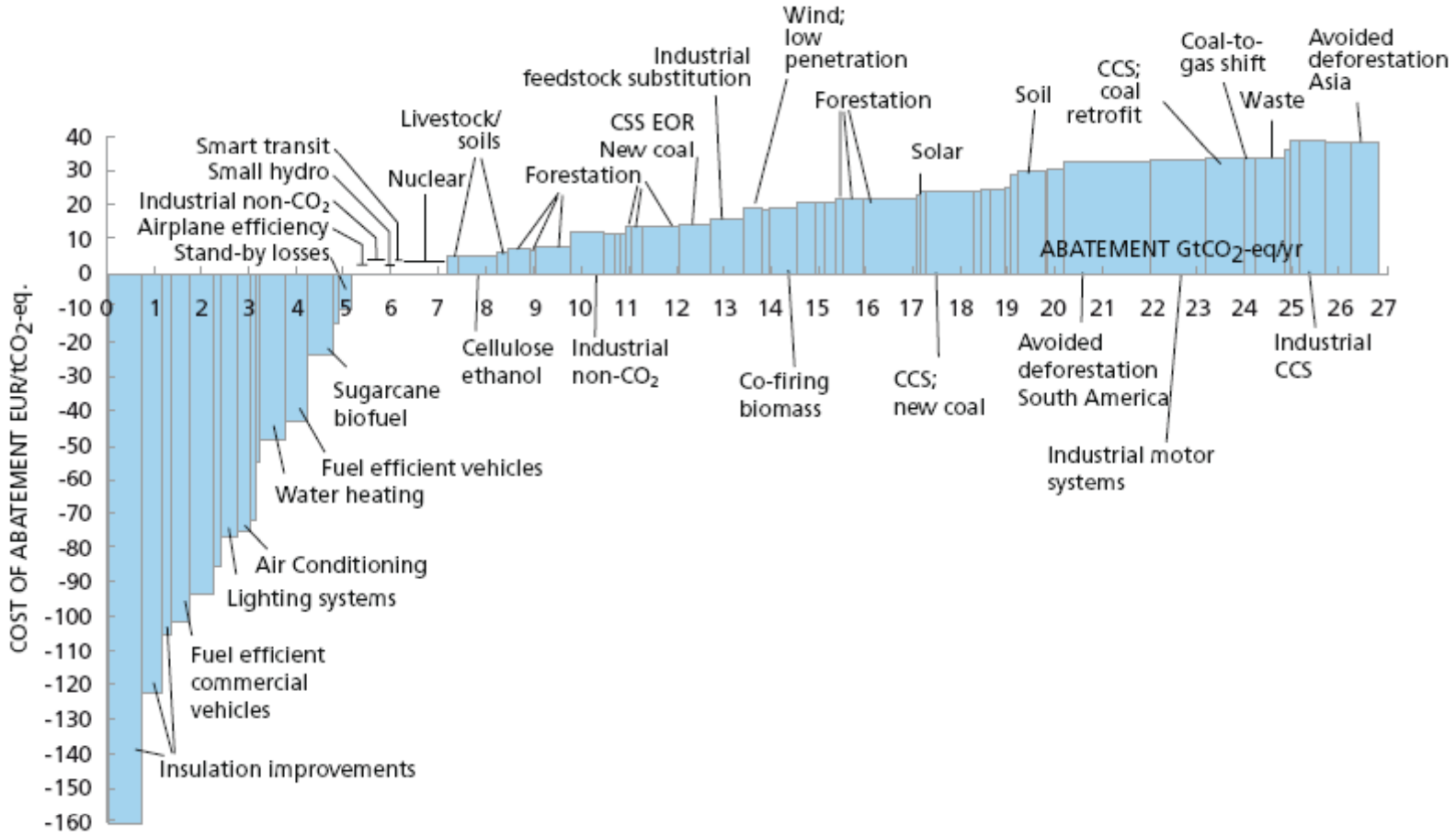
Polices, measures and instruments shown to be environmentally effective

Sector	Mitigation ’tools’
Buildings	• Appliance standards and labelling • Building codes and certification •Demand-side management programmes • Public sector leadership programmes including procurement • Incentives for energy service companies
Industry	• Provision of benchmark information • Performance standards • Subsidies, tax credits • Tradable permits • Voluntary agreements

Policies, measures and instruments shown to be environmentally effective

Sector	Mitigation ’tools’
Agriculture	• Financial incentives and regulations for improved land management • Maintaining soil carbon content • Efficient use of fertilizers and irrigation
Forestry	• Financial incentives (national and international) to increase forest area and reduce deforestation and maintain and manage forests • Land use regulation and enforcement
Waste management	• Financial incentives for improved waste and wastewater management • Renewable energy incentives or obligations • Waste management regulations

Costs and benefits of decarbonising the Economy



Source: Kammen in Synthesis Report, Climate change congress, by Richardson et. al., March 2009, Copenhagen

Sustainable development

Low-carbon development

- Making development more sustainable by changing development paths can make a major contribution to climate change mitigation

- Irrespective of the scale of mitigation measures, adaptation measures are necessary

- Changes in development paths emerge from the interactions of public and private decision processes involving government, business and civil society. This process is most effective when actors participate equitably and decentralized decision making processes are coordinated.

Changes in lifestyle and behavior patterns

- Changes in lifestyle and consumption patterns can reduce GHG emissions

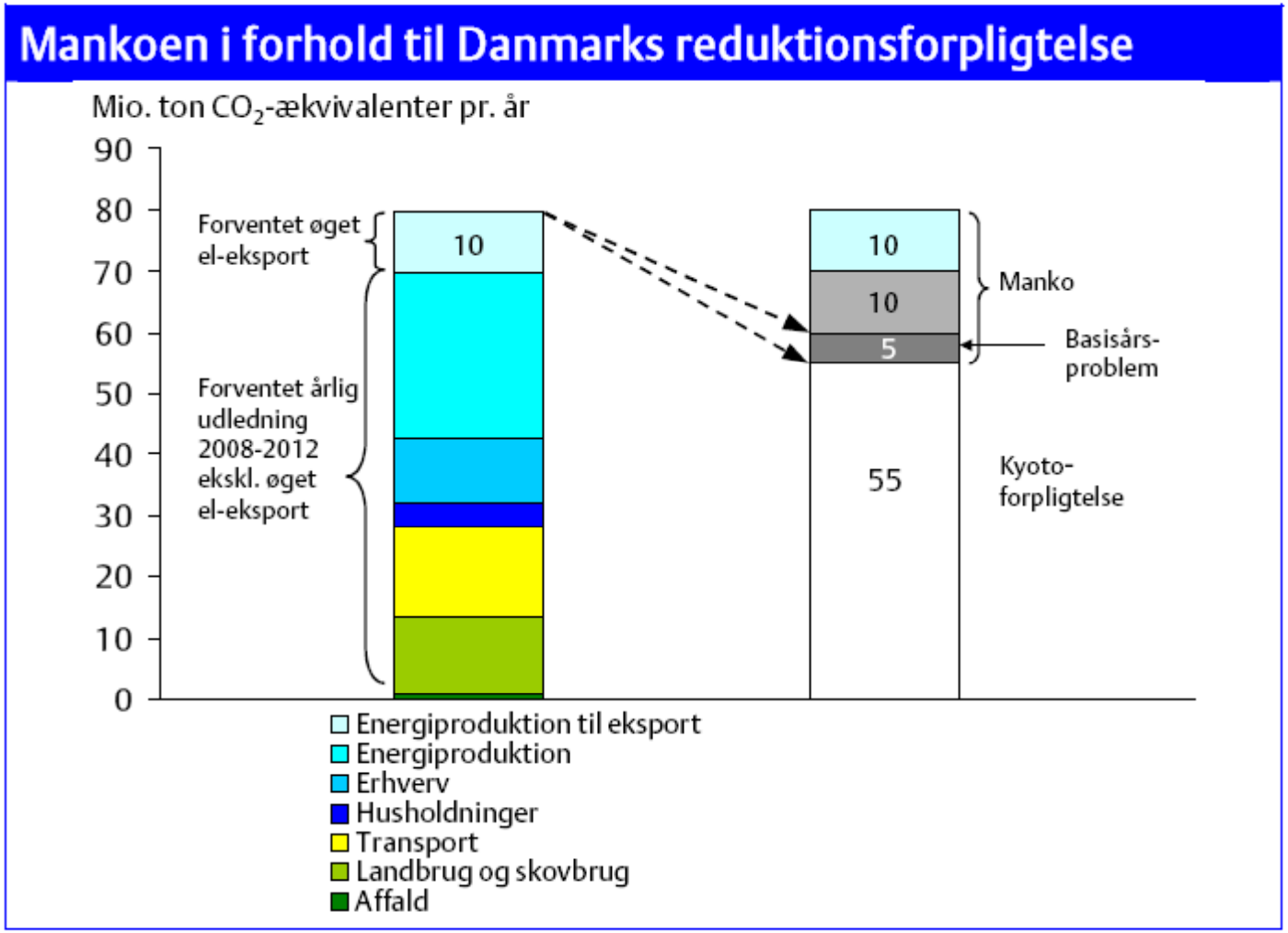
- Education and training can help overcome barriers to the market acceptance of energy efficiency

- Transport demand management including urban planning and provision of information and educational techniques can support GHG mitigation

- In industry, management tools that include staff training, reward systems and documentation of existing practices can help overcome inustrial organizational barriers, reduce energy use and GHG emissions

Examples of national mitigation strategies

Denmark’s climate mitigation challenge



Denmark’s means to fulfill its Kyoto target

Tabel 1. Virkemidler til opfyldelse af klimaforpligtelsen 2008-2012

	Reduktions-potentiale pr. år, mio. ton CO_2		Samfunds-økonomisk enhedsomkost-ning, kr. pr. ton CO_2	
Virkemidler med stort potentiale:				
Varmepumper – fortrænger decentral kraftvarme	Ca. 1½		-60	2)
Begrænsning af el-produktion	Ca. 2-8		20-60	3)
Fleksible mekanismer	–	1)	50-100	
Omstilling fra kul til naturgas	Ca. 3		150	
Varmepumper – fortrænger central kraftvarme	Ca. 5		250	2)
Havvindmølleparker	Ca. 2		270	2)
Yderligere omstilling fra kul til naturgas	Ca. 5		280	
Ombygning til biomasseanlæg	Ca. 2½		290	2)
Deponering i undergrunden på land eller i oliefelter	–	1)	160-310	
Virkemidler med mindre potentiale:				
Normer for vinduer	0,2		-550	
Normer for olie- og gaskedler	0,1		-500	
Flaregas genindvinding	0,3		-330	
Varmepumper – fortrænger oliefyret fjernvarme	0,8		10	2)
Etablering af biogasfællesanlæg	0,5		40	
Yderligere metan-opsamling fra lossepladser	0,1		180	
Ændret fodring af malkekøer	0,4		590	
Brug af biobrændstoffer	0,5		740	
Kørselsafgifter på personbiler	0,5		1140	
Øgede brændstofafgifter (1 kr./liter)	0,6		1430	

Which government?
South Africa!

Government’s vision for the road ahead on climate change

National circumstances:

- coal based economy (high transition lag time), high emissions per capita, associated with major advanced developing economies, relatively wealthy with institutional capacity, extremely vulnerable to impacts of CC, targeted for US differentiation (i.e. no access to finance and technology)

Policy response to mitigation challenges:

- Transition to climate resilient and low-carbon economy without compromising the need for economic growth and development
- Limit global temperature increase to 2°C above pre-industrial levels
- LTMS - peak, plateau and decline - stop growing at the latest by 2020-2025, stabilise for up to ten years, then decline in absolute terms
- Need to starte now with emission reductions: EE, RE, clean and new technology, nuclear energy, economic and fiscal instruments

China’s energy and climate policy actions

Adopted a 20% reduction in national energy intensity by 2010

- implemented energy efficiency programs
- raised taxes on petroleum
- adopted new rural vehicle fuel economy standards
- energy conservation law for local governments put in place, 2008

Passed national renewable energy standard of 15% by 2020

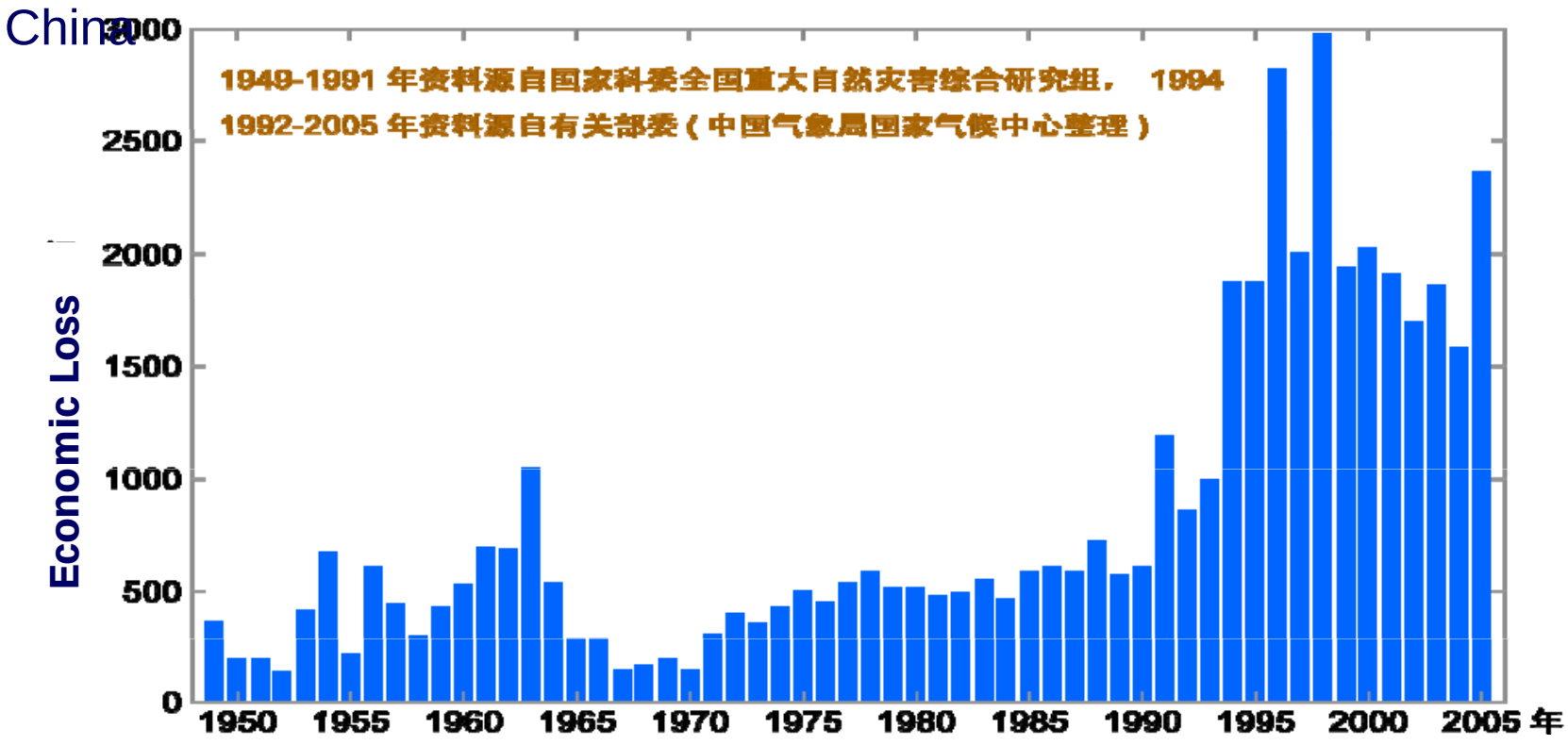
- set wind power goals in 2005 – 5GW by 2012 & 30 GW by 2020
- grew its solar industry
- diversified domestic energy sources

Promoted infrastructure for green development

- rail and electric grid construction, EE in new buildings, subsidies for small vehicles, fuel cells and public busses, EE lighting

All domestic actions put in place for local development reasons

China: Increasing amount of economic loss caused by climate disasters



Source: GAO Guangsheng, NDRC, COP12, Nairobi

Achievements of the UNFCCC and its Kyoto Protocol

- The Covention and Protocol represent the global policy response to the climate problem

- They have stimulated an array of national policies, the creation of an international carbon market and the establishment of new institutional mechanisms that may provide the foundation for future mitigation efforts

- However, the impact of the Protocol’s first commitment period 2008-12 relative to global emissions is projected to be limited

- Many options exist for achieving further reductions of global GHG emissions at the international level through cooperation. These are now intensively negotiated up to the COP-15 in Copenhagen, December 2009.

Carbon markets and CDM

Kyoto Protocol

Emissions reduction:

- **5.2% reduction of emissions from Annex I in 2008-12 compared to 1990**
- **30% reduction compared to BaU**

Flexibility mechanisms”

- **Clean Development Mechanism (CDM)**
- **Joint Implementation**
- **Emissions trading**

Important to see Kyoto as a first step in a longer process

Global Carbon Market

- fragmented market

Allowance market (cap and trade system)

- Emission allowances are defined by regulations at the international, national, regional or firm level - Kyoto-ET, EU-ETS, Domestic: UK, Japan, Canada, Korea. Firms: BP, Shell
- Linkage between EU ETS and project-based mechanisms

Project-based (baseline and credit system)

- Emission reductions are created and traded through a given project or activity (JI and CDM)

Voluntary market

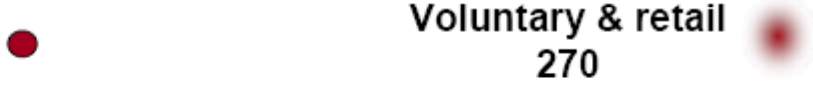
- Individuals and companies account and trade their greenhouse gas emissions on a voluntary basis (carbon compensation and travel compensation schemes)
- Several companies expressed interest in buying project-based credits

Markets are likely to emerge over time as agreement widens

M3 – “Mitigation” and the labour market

Carbon markets surpassed US$100 billion by the end of 2007…

Voluntary market in 2007 – niche segments (US$ million)



Source: WB State and Trends of the Carbon Market 2008, Reuters 2008

Clean Development Mechanism (CDM)

CDM Basics

CDM allows Annex I countries meet part of their emission reduction requirements for first commitment period 2008-2012 at lower costs in non-Annex I countries than could be done domestically.

Annex I countries are allowed to acquire Certified Emission Reductions (CERs) by implementing GHG mitigating CDM projects in non-Annex I countries.

Selling CERs is an additional stream of cash inflow to the project, which improves project economics.

ODA (Official Development Assistance) funds can not be used in CDM investments.

CDM projects shall support sustainable development in the host country

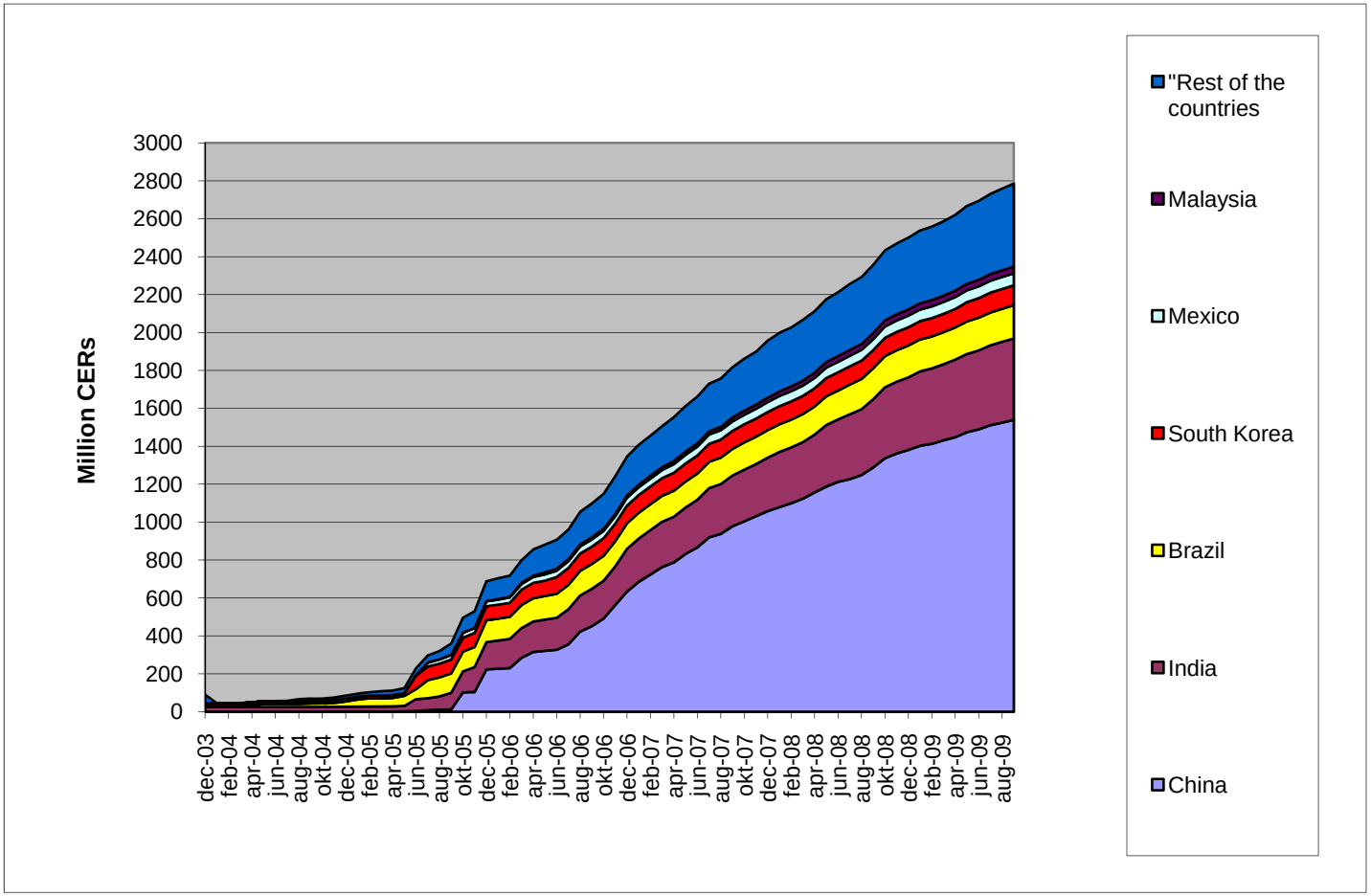
CDM is considered one of the major achievements of Kyoto

Number of CDM projects

Status of CDM projects	Number
At validation	**2607**
Request for registration	70
Request for review	56
Correction requested	93
Under review	13
Total in the process of registration	**232**
Withdrawn	40
Rejected by EB	122
Rejected by DOEs	581
Registered, no issuance of CERs	1268
Registered. CER issued	566
Total registered	**1834**
Total number of projects (incl. rejected & withdrawn)	5416

Source: UNEP Risoe Centre CDM Pipeline dated 1 October 2009

Host countries of CDM projects



Source: UNEP Risoe Centre CDM Pipeline dated 1 October 2009

CDM project examples

Kuyasa, Cape Town, South Africa

- low-income housing retrofit in 2309 RDP houses
- Install SWH, insulated ceilings, and CFL lighting
- first registered SA project
- first Gold Standard project in housing sectors

Proposal to upscale to a programmatic CDM project:

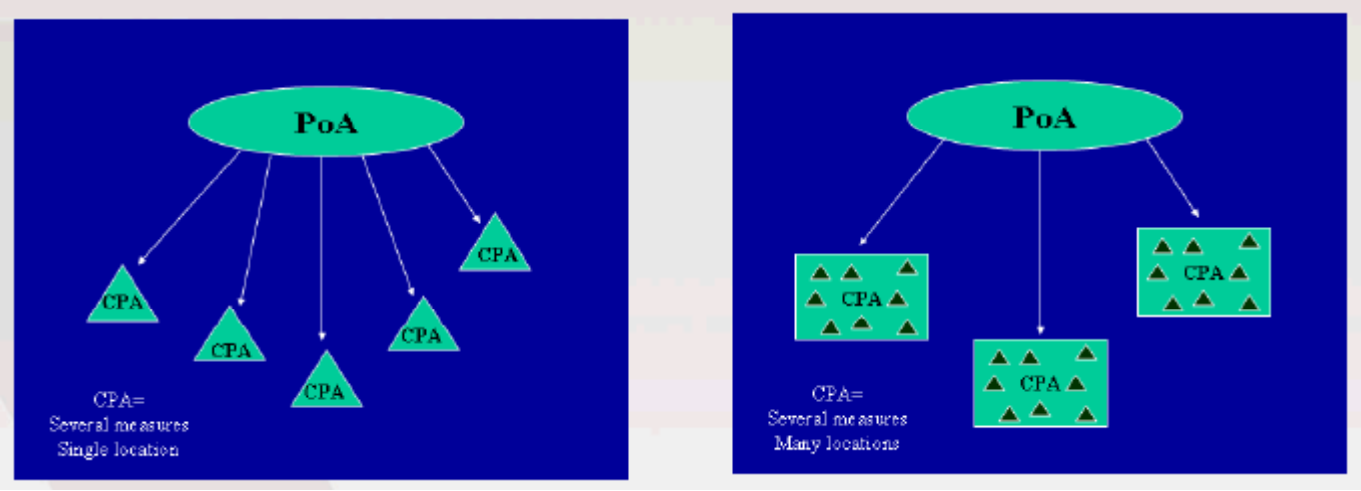
- VISION: A clearing house which enables and incentivises access to financing for clean energy services in all low income housing in South Africa
- MISSION: To establish a Facility which 1) administers a CDM programme, and 2) leverages and manages access to the additional upfront financing required for the incremental capital costs of sustainable energy interventions in low income housing

Programmatic CDM projects

A Programme of Activities (PoA) is:

- Voluntary action
- Implementing a policy, meaure or stated goal
- Coordinated by a public or private entity
- Made up of CDM Programme Activities (CPA)

Multiple CPAs can be included under a PoA at the time of registration and additional CPAs can be added at any point in the life of the PoA



Global Overview

Bangladesh - 4 - solar home system + cooking stoves

Brazil - 2 - Methan avoidance agriculture

China - 2 - Irrigation

Hondarus - 2 - Hydro

India - 4 - CFL

Mexico - 2 - CFL

Senegal - 2 - CFL

South Africa - 3 - solar water heating + heat retention cookers

South Korea - 2 – Energy Efficiency in industry

Tunesia - 2 - solar water heating

Uganda - 2 -waste composting

Vietnam - 2 – Solar water heating

First PoA registration – CUIDEMOS (smart use of energy), Mexico

The project seeks to reduce GHG emissions through free distribution and installation and installation of 30 million energy-saving light bulbs throughout Mexico.

Change from Incandescent lamps to Compact Flourescent Lamps (CFL)

PoA lifetime 31 July 2009 – 30 July 2037

Crediting Period 31 July 2009 – 30 July 2016

CDM Challenges

Complex CDM Modalities & Procedures:

- Transaction cost to hire service providers.

Heavy institutional requirements for project cycle (DNA, DOE Validation, DOE Verification, etc.).

Knowledge gap between CER buyers & sellers.

Limited access to finance by potential developers:

- Financial intermediaries lack of knowledge about CDM.
- Lack of trained national CDM consultants.
- Investment climate in host countries (e.g. SS Africa).
- Limited budgets for operations of DNAs.
- Need for national entities capable of bundling projects.

CDM is undergoing gradual reforms and will be part of a new deal

This site currently holds **3 postings** from **23 registered users**

Sellers →

The Seller section shows seller profiles, including contact information, and the projects which have been added by registered Sellers.

Go to this section to:

- View seller entries and details of sellers in the carbon market
- View project entries and details of CDM projects and CERs at various stages
- View sellers and projects, and sort them according to your requirements

> Visit sellers section

Latest seller profiles

22-8-2007 | Enel Trade S.p.A.

> See all sellers' profiles

Buyers →

The Buyer section shows profiles of buyers in the carbon market, including preferences and contact information.

Go to this section to:

- View buyer entries and details of buyers in the carbon market
- View detailed purchasing profiles of buyers
- View buyer profiles, and sort them according to your requirements

> Visit buyer section

Latest buyer profiles

28-8-2007 | Danish Ministry of Foreign
24-8-2007 | Carbon Asset Management Sw
23-8-2007 | TFS Energy
22-8-2007 | Enel Trade S.p.A.
20-8-2007 | Natsource LLC

> See all buyers' profiles

Service providers →

The Service provider section shows profiles of companies, including contact information, who supply carbon market technologies and services.

Go to this section to:

- View service provider entries
- View detailed profiles of service providers
- View service providers, and sort them according to your requirements

> Visit service provider section

Latest service provider profiles

28-8-2007 | Bureau Veritas Certificati
27-8-2007 | AENOR
27-8-2007 | DNV Certification AS
24-8-2007 | SV Carbon Sdn. Bhd
24-8-2007 | Caspervandertak Consulting

> See all service providers' profiles

Search

Find

Signup

Register to add your profile to the CDM Bazaar, and to add project information or announcements.

> Register

Login

Select profile

Username

Login

> Signup

Announcements

Employment opportunities

> See all employment opportunities

Events

17-8-2007 | Latin American CarbonForum...

> See all events

Publications

15-8-2007 | Overcoming Barriers to CDM...
14-8-2007 | CDM/JI Pipeline Analysis a...

> See all publications

Thank You !!

CD4CDM
CAPACITY DEVELOPMENT FOR THE CLEAN DEVELOPMENT MECHANISM

For more information visit:

www.cd4cdm.org

http://cdmpipeline.org/

www.uneprisoe.org

http://cdmbazaar.net/